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PROJECT DOCUMENT REVIEW RECORD

DOCUMENT TITLE/DESCRIPTION: Central Facilities Area Landfills I, II, and III Annaul Monitoring Report (2002) .

DATE: 05/27/2003

ITEM NUMBER	SECTION NUMBER	PAGE NUMBER	COMMENT	RESOLUTION
			General Comments	
1.			The monitoring report avoids discussion of the obvious lack of ground water monitoring down gradient of Landfills I and II and confirms that Landfill III has marginal coverage, at best. Ground water monitoring wells are needed down gradient of these landfills and these wells should have vapor ports attached to provide better vertical coverage of the vapor plumes and to ascertain whether the concentrations in the vapor plumes are near the Henry's Law partitioning value that could cause a potential ground water contamination issue. Vapor port monitoring wells (minimum of 2) *are* needed near the south end of Landfill II and near the southwest comer of Landfill I to better delineate the bounds of the vapor plumes spatially. Vapor port monitoring should continue to determine whether apparently increasing vapor concentrations above the first interbed will continue and whether the vapor plumes will propagate through the interbed toward the aquifer.	A recommendation will be added to include a new monitoring well south of Landfill I and in the southeast corner of Landfill II. A vapor port will be added near the water table for both wells.
2.			Interpretation of the moisture monitoring data, comparison of NAT and TDR data, and extrapolation of this data to the landfills as units seems to be complicated by numerous factors related to either probe issues or location. These factors include TDR probe calibration and physical nonconformity in the subsurface, snow accumulation and runoff around NAT LF2-07, and snowdrift accumulation on the edge of the landfills. A plan to address the TDR probe calibration issues should be developed and implemented. **Likewise, for location issues, the extent to which these monitoring locations are representative of landfill conditions should be discussed and, if necessary, changes made. For example, are the low spots identified with LF2-07 typical of the landfill and, if so, what percentage? If not, what value is being gained by monitoring at this location? This is reinforced by the dramatic differences in. recharge estimates between the TDR and the NAT locations.**	The TDR and NAT data will be utilized in a model that will be recommended to evaluate the landfill covers. The representativeness of the monitoring locations, TDR and NAT, will be discussed. It will be pointed out that the low spot near LF2-07 is not common and that the TDR and NAT LF3-05 are probably more representative of the majority of the cover. A recommendation will be added to calibrate the TDRs.

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3.			Presentation of data in future monitoring reports could be improved by including several items: - Provide more information on the distribution, extent, and rooting depth of plant cover on the landfills. - Provide graphs of moisture content versus depth for critical dates during the drainage/recharge period for the various locations. The 3D plots of changes in NAT moisture contents are difficult to read. Similarly the plots of TDR raw data for each 0.5-foot interval, while useful, make it difficult to determine a more integrated picture of water movement through the profile.	Providing information on the rooting depths would require digging numerous holes in the landfill covers. The rooting depths will be evaluated in the modeling of the landfill covers. Requested graphs will be provided in future reports.
4.			There does not appear to be a performance standard for recharge that the covers were intended to meet. Based on the data collected to date it is difficultto say whether the covers are any more effective than natural conditions in limiting recharge and if the amounts estimated are adequate to prevent impacts to groundwater. Of the two landfill NATs, one, LF2-07, demonstrated an average recharge greater than background, while the other had non-measurable amounts.	It will be recommended that the performance of the covers be evaluated using an analytical model such as HYDRUS-1D.
Specific Comments				
5.	Section 2.1	Page 6 'and Figure 3, Page 10	The revised water table contour map (Figure 3) clearly shows that Landfill I is not covered by even a single monitoring well, and all but a small corner of Landfill II is not covered by a single monitoring well. As contended for several years by DEQ, additional monitoring wells are needed to provide ground water monitoring down gradient of these landfills. The locations for at least two monitoring wells should be determined to provide adequate down gradient coverage.	A recommendation will be added to include a new well south-southeast of Landfill 1 and southeast of Landfill 11.
6.	Section 2.2	Page 6, Paragraph 2 and Figure 2, Page 7	Two wells described in this paragraph are not shown on Figure 2. Please add wells LF2-08 and LF2-10 to the figure.	These wells will be added to Figure 2.

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7.	Section 2.2	Tables 2, 3 & 4, Pages 11, 12, & 13	Please provide an explanation for the "J" flag on the nitrogen data. The detection limit for nitrate as nitrogen is usually well below 1 mg/L but only one value is below 1 mg/L. Past experience has shown the lack of acidification of the samples results in a holding time that sometimes cannot be met. If this is again the cause of flagged values, DOE needs to reconsider the sample preservation methods and consider acidifying the samples to extend the holding time for this parameter.	The nitrate data was flagged J because the calibration range check (CRC) was outside the acceptance criteria of 95 to 105 %. The CRC was 114%. This will be added as a footnote to Tables 2,3, and 4.
8.	Ibid,	Page 18	Please state whether the samples were filtered or not filtered with respect to the iron concentrations.	It will be stated that the samples were unfiltered.
9.			The vapor monitoring results indicate the need for further monitoring both spatially and temporally. Vapor port monitoring wells GSP1-1 and 3-1 implies their location is in proximity to a potential source of volatile organic compounds. Both 1,1,1-trichloroethane and 1,1-dichloroethene are of interest because of their elevated concentrations and increasing concentrations down to the top of the first interbed. In addition, trichloroethene and trichlorofluoromethane appear at lower concentrations than the other volatiles but the vapor concentrations appear to be increasing over time at the two vapor ports located above the first interbed as illustrated in figures 7c and 7d (page 24). New vapor monitoring wells (2) are needed at the southern end of Landfill III and near the southwestern comer of Landfill I to give a better spatial representation of the vapor plumes. The additional vapor port wells should be drilled to a greater depth to ensure that vapor concentrations we not near the vapor concentration that could partition into the aqueous phase and cause a ground water contamination issue. A simple calculation based on Henry's Law indicates vapor concentrations should not exceed 1,120 µg/L for trans-1,2-dichloroethene, 12.3 µg/L for tetrachloroethene, 55.3 µg/L for 1,1dichloroethene, and 150 µg/L for 1,1,1-trichloroethane in order to not exceed the MCL for these compounds. Similar vapor concentrations can be developed for the other volatile compounds.	It will be recommended to add deep vapor ports to the new monitoring wells for Landfills I and II. The need for vapor modeling will be recommended to be evaluated in the future.

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10.	Section 4.4	Page 33	It is stated that the placement of the new cover has significantly reduced recharge at Landfills II and III. It is unclear that the decreases observed can be strictly attributed to the cover. When one compares the four-	A recommendation will be added to model the Landfill cover performance. .
11.	Section 5.2.2.1	Pages 39-40	This discussion provides a convincing argument that the source of the nitrogen is not the CFA-08 drainfield as originally proposed and as supported by the refined ground water elevations and resultant ground water flow paths in the area around CFA. The technical staff is commended for this new look at this old problem.	Thanks.
12.	Appendix B	Figure 5-6, Page B-34	Please place units of measure on the axes of these plots.	Units will be placed on the plots.
13.	Appendix C	Section C6, Page C-9	The third paragraph states "dispersivity is a scale-dependent phenomenon, larger model domains typically require larger values for dispersivity." It is suggested that this terminology be tempered to acknowledge the uncertainty associated with estimating longitudinal, transverse, and vertical dispersivity as noted by Gelhar, Welty, and Rehfeldt (July 1992). Gelhar, et al, state "The data suggest that there is a scale dependence of longitudinal dispersivity but reliable data must be collected at larger scales in order to establish the nature of dependence." The scale dependence is not as clear-cut as stated for the scale at issue at CFA. Also, recent modeling at TAN indicates a low value for longitudinal dispersivity that does not fit this conceptual model. Some revision is needed in this section to modify the equation and to provide references for the approach noted. Equation C-1 appears to have come from Xu and Eckstein (November-December 1995) after their	I appreciate the reviewers detailed review of the dispersivity issue and noting the error in Xu and Eckstein's (1995) original equation by Al-Suwaiyan (1996). I will make the change in the GWSCREEN code and documentation. I do not question the uncertainty associated with estimating longitudinal dispersivity and recognize that longitudinal and transverse dispersivity estimates at the INEEL have evolved over the years beginning with the estimates made by Robertson (1974) of 91 [redacted]

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			equation 14b for the weighting scheme designated 1:2:3. *An* error was found in the database used in this analysis by Al-Suwaiyan (July-August 1996). Al-Suwaiyan corrected equation 14b to account for the incorrect data point. The corrected equation is: $\alpha_L = 0.82\ (\log_{10} L)^{2.446}$. Although the correctly calculated longitudinal dispersivity **used** in the **GWSCREEN** model does not change at a scale of **152** meters, it is suggested that the corrected equation be used in the scale dependent set-up of **GWSCREEN.** Also, it is suggested that a range of values be used even if a fixed value is used for greater distances. *An* appropriate low value for longitudinal dispersivity **can** be linked to the recent **MODFLOW** model developed for the TCE plume at TAN for some of the larger scales at issue at CFA.	m and 137m for longitudinal and transverse dispersivity respectively. I will perform some sensitivity/uncertainty analysis on this these two parameters and review the recent **MODFLOW** model development for the TCE plume and TAN when developing **a** reasonable range of values **to** use in the analysis.
			References Sited	
			Mohammad **S.** Al-Suwaiyan. July-August **1996.** ***Discussion*** on ***Use of Weighted Least-Squares Method in Evaluation of the Relationship Between Dispersivity and Field Scale,*** vol. 34, no. **4,** page **578.**	
			Lynn W. Gelhar, Welty, Claire, **and** Rehfeldt, Kenneth R. July 1992. A ***Critical Review of Data on Field-Scale Dispersion in Aquifers,*** Water Resources Research, vol. 28, no. 7, pages' **1955-1974.**	
			Moujin Xu and **Eckstein, Yoram.** November-December 1995. ***Use of Weighted Least-Squares Method in Evaluation of the Relationship Between Dispersivity and Field Scale,*** vol. ***33,*** no. 6, pages 905-908.	

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